Answers to Additional Problems Unit Five

1. Hypothesis:

1) $f'(x) = 6x + 5$ exists on $\left(-2, \frac{1}{3}\right)$

2) $f(x)$ is continuous on $\left[-2, \frac{1}{3}\right]$

3) $f(-2) = 0$

4) $f\left(\frac{1}{3}\right)$=0

Therefore, c exits in $\left(-2, \frac{1}{3}\right)$. $c = -\frac{5}{6}$

2. Hypothesis:

1) $f'(x) = 2x - 2$ exists on $(-1,8)$

2) $f(x)$ is continuous on $[-1,8]$

Note: The slope of the secant line joining (-1,8) and (8,53) is 5.

Therefore, c exists in (-1,8). $c = \frac{7}{2}$

3. The base of the triangle is $x - 5$. The height of the triangle is also $x - 5$. The area of the triangle is $\frac{1}{2}(x-5)^2$.

4. $-\frac{1}{x} + \frac{3}{5} x^{\frac{5}{3}} + c$

5. $-7\cos x + c$

6. $\frac{x^5}{5} - 8x + 3\ln x + c$

7. $10x + c$

8. $\frac{2}{3}\sec^{-1}\frac{x}{3} + c$

9. $\frac{1}{10}\tan^{-1}\frac{2x}{5} + c$

10. $-\sqrt{2}\ x^{-\frac{1}{2}} + c$

11. $y = \frac{2}{3}\left(1+x^3\right)^{\frac{3}{2}} + \frac{1}{3}$

12. $\frac{-6}{\sqrt{x-1}} + c$

13. $\frac{p}{6}$

14. $-\sqrt{4-x^2} + c$

15. $\sin^{-1}\frac{x}{2} + c$

16. $\frac{2}{3}$

17. $-\cos(\ln x) + c$

18. e

19. $\frac{(\ln x)^3}{3} + c$

20. $3e^{\frac{x}{3}} + c$

21. $2\tan^{-1}\sqrt{x} + c$

22. a) 135
b) $98p$

23. $\sum_{i=1}^{6}\frac{3}{i^2}$

24. $12{,}485$

25. $3n^2(n+1)$

26. $\sqrt{1+x^2}$

27. $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{8i^2}{n^3} + \frac{8i}{n^2} + \frac{8}{n} \right) = 14\frac{2}{3}$

28. $f(x) = 2x + 5 \;\; \textit{from} \;\; x = 1 \; \textit{to} \;\; x = 3.$ The geometric figure is a trapezoid with height of 2, one base of 7 and the other base of length 11. The area is 18 square units.

29. $\ln 6$

30. $s(t) = 2t^3 + 4t^2 - 3t + 15$

31. Displacement = 65
Distance = 97 Note: $v < 0 \; \textit{if} \; 0 < t < 2 \quad \textit{and} \quad v > 0 \; \textit{if} \; 2 < t < 5$

32. $v_0 = 160\, ft/\sec$

33. $144\, \textit{feet}$

34. 99